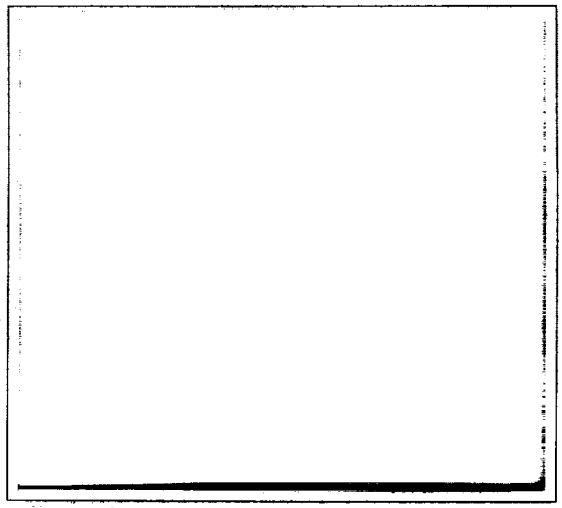
Consortium for International Earth Science Information Network



A Report to:

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
Code 285
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LETTER CONTRACT NAS5-32632
Contract Data Requirements List Item 7

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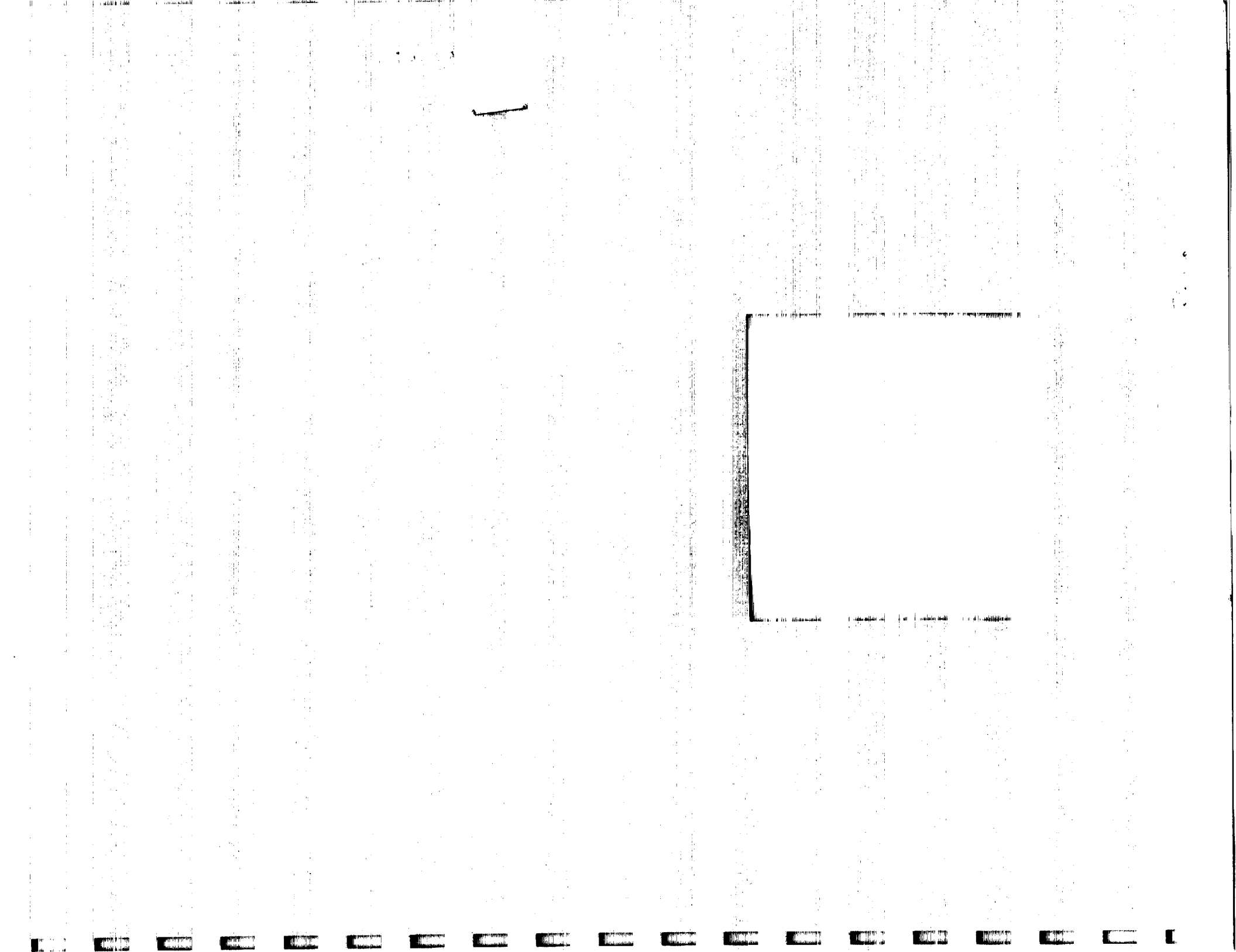

Consortium for International Earth Science Information Network
Saginaw, Michigan

SEDAC
Annual
Progress Report

June 28, 1994 to June 27, 1995

Prepared Under Letter Contract NAS5-32632

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Preface

This *Annual Progress Report* is submitted as required by Contract NAS5-32632 for the Development and Operation of the Socioeconomic Data and Applications Center (SEDAC) in fulfillment of Contract Data Requirements List item no. 7 (CDRL-7). This report constitutes a key input into the SEDAC Annual On-Site Review.* As required by the SEDAC Statement of Work (Revision 2, August 9, 1994), the Progress Report is to be updated annually.

The Annual Progress Report documents the major SEDAC deliverables and other accomplishments during the past year. It lists key reports and report updates as well as other significant SEDAC outputs. It also summarizes the principal accomplishments of each task and subtask in SEDAC's Work Breakdown Structure.

Questions or proposed changes should be addressed to:

SEDAC Manager
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* Note: at the request of the Contract Officer's Technical Representative (COTR), the Annual On-Site Review for SEDAC's first contract year is being held early in the first option year.

Executive Summary

The Socioeconomic Data and Applications Center (SEDAC) is one of nine Distributed Active Archive Centers (DAACs) in the Earth Observing System Data and Information System (EOSDIS) of the National Aeronautics and Space Administration's Mission to Planet Earth (MTPE) Program. SEDAC is operated by the Consortium for International Earth Science Information Network (CIESIN) based in Saginaw, Michigan. The first year of SEDAC's contract began on 28 June 1994.

During the past year, SEDAC has developed and implemented a basic SEDAC System Operating Capability (SSOC) designed to meet its two primary missions: *1)*to develop new policy-oriented information products and operational services that synthesize Earth science and socioeconomic data; and *2)* to serve as a two-way "Information Gateway" between the socioeconomic and Earth science data and information domains. In accomplishing this goal, SEDAC has delivered more than 18 CDRL items to NASA's Goddard Space Flight Center (GSFC) and completed a number of key reviews. All deliverables have been developed with the guidance and feedback of the COTR, MTPE scientific staff, the SEDAC User Working Group (UWG), and others.

The SSOC presently includes three major areas of activity: *1)* interactive access to integrated data on population, land cover, and emissions for the U.S.; *2)* interactive tools for visualization and analysis of the inputs and outputs of selected integrated assessment models (IAMs) of climate change; and *3)* a "Gateway" system designed to provide social and natural scientists and other users with search-and-order capabilities across distributed catalogs of data relevant to the human dimensions of global environmental change, including directory entries held by the Global Change Master Directory (GCMD). During the past year, SEDAC has acquired and begun to disseminate selected human dimensions datasets including a number of unique georeferenced population data products. It has also compiled a significant collection of directory entries for human dimensions data held by institutions around the world.

SEDAC has also developed a number of unique "proof of concept" and prototype applications that could serve as a basis for implementing future operational services in support of SEDAC's missions. These applications include a Policy Instruments Data Base that provides online query capabilities against a data base of international environmental treaties and associated status information; a range of online guides that include scientific literature and technical documentation concerned with human dimensions data and research; a structured toolkit for communications between HyperText Markup Language (HTML) documents and relational data bases; a set of data and models that permit assessment of the potential risks of stratospheric ozone depletion for public health; and an interactive tabulation system that utilizes advanced parallel-processing techniques to provide rapid access to large tabular datasets.

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1.0 Establishment of SEDAC

As indicated in the SEDAC Statement of Work (SOW), SEDAC has two key missions. The first is to support the MTPE program by contributing to its goal of translating scientific understanding into tangible benefits to the American people by developing new policy-oriented information products that synthesize Earth science and socioeconomic data and by providing the resulting operational data and information services to the public. SEDAC's second mission is to serve as a two-way "Information Gateway" between the socioeconomic and Earth science data and information domains.

At the start of the SEDAC contract on 28 June 1994, CIESIN was able to move quickly to put the basic SEDAC framework in place, drawing in part on prior work carried out under NASA Grants NAGW-2010 (1991-92) and NAGW-2901 (1992-95). These NASA grants provided important elements of the data, information, and technology infrastructure needed for SEDAC to move rapidly ahead in developing products and services that addressed SEDAC's new mission. These elements included:

- A distributed catalog subsystem and a thematic-based information resource discovery subsystem that is interoperable with EOSDIS information directories.
- The capability to archive, manage, and disseminate socioeconomic and interdisciplinary data efficiently across their full "life cycle", including data identification and acquisition, documentation, metadata development, data conditioning, product specification and development, updating and maintenance, and disposition;
- A selection of on-line data access and analysis tools, dynamic browse tools, algorithms, computer models, and other applications software;
- The ability to link with the data catalogs, holdings, and other information resources of partner organizations in CIESIN's Information Cooperative, a worldwide network of institutions involved in the management and dissemination of socioeconomic and environmental data and information;
- Collaborative relationships with selected faculty at Consortium partners such as the University of Michigan and Polytechnic University and with other members of the scientific community interested in particular topics or types of data such as georeferenced population data, integrated data on China, and international environmental treaties;
- Access to a range of information resources including selected thematic guides on key global change topics, a human dimensions kiosk, and a large collection of metadata related to the social sciences;

- Experience in assessing the data and information needs of resource managers, decision makers, and others at local, regional, national, and international levels;

- A range of computing and network resources linked both internally across multiple CIESIN offices and externally with the Internet;

- An active user services office with the experience and basic infrastructure to help users with their data and information needs; and

- Highly skilled, interdisciplinary science and engineering staff and faculty from CIESIN and its Consortium member institutions—available to SEDAC as needed by assignment or through personnel agreements and subcontracts, and capable of developing innovative products and services involving the integration of natural and social science data.

Since the beginning of the SEDAC contract, these elements have been systematically integrated into a functional SEDAC effort. As directed by NASA, Grant funds were utilized to facilitate this transition and to ensure rapid establishment of SEDAC capabilities and organization.

2.0 SEDAC First-Year Deliverables

The first major deliverable under the SEDAC Contract, the Management Plan (CDRL-15), established SEDAC's operating structure, management team, and overall management approach. In response to comments at the Program Management Review held on-site on 1-2 August 1994, a revised Management Plan was issued which clarified the role and make-up of the SEDAC Project Office within CIESIN. The Project Office is led by the SEDAC Manager and includes the SEDAC Project Scientist, SEDAC Systems Engineer, the SEDAC Managers of Computer Services and User Services, and the Administrative Analyst. The SEDAC Manager reports directly to the President & Chief Executive Officer of CIESIN. The Plan identifies the key SEDAC personnel and establishes the Policy Applications Development Team, the System Development Team, the Operations and Maintenance Office, the User Support Office, and the overall SEDAC Work Breakdown Structure (WBS).

SEDAC's major activities during the year concerning the development of new products and services have been driven by the Policy Applications Development Plan (CDRL-12), prepared in draft form in August 1994 and in final form the following month. This plan identified opportunities for developing new applications, documented the process of selecting opportunities for further SEDAC exploration and implementation, and, for the selected application areas, detailed the activities needed to identify and involve users in their design and implementation. The initial version of the Plan (September 1994) selected two key application areas for initial SEDAC development:

1) Population, land use, and emissions; and

2) Visualization and analysis of integrated assessment models of climate change.

SEDAC's approach to the development of the SEDAC Information Gateway was described in the Information Gateway Plan (CDRL-13), also developed in draft form in August 1994 and delivered in final form in late September. The IGP identified key areas of interdisciplinary research related to global change and reviewed the needs of social and natural scientists for access to earth science, social science, and interdisciplinary data and information resources. It established the need for the development of metadata, for a distributed catalog system, and for interoperability between systems.

These two reports served as the main foundation for SEDAC's subsequent development. Based on these reports, NASA guidance, and other inputs, SEDAC prepared the Annual Work Plan (CDRL-16), the Functional and Performance Requirements Specification (CDRL-6), the Requirements Analysis (CDRL-4), the Architecture and Operations Concept Document (CDRL-5), and the Science Data Plan (CDRL-14). The Preliminary Design Review held at NASA headquarters on 29 November 1994 provided NASA with the opportunity to assess the overall SEDAC approach and to review specific plans and initial designs.

Working with NASA's MTPE program, SEDAC also formed the SEDAC User Working Group (UWG) in the fall of 1994. Due to delays in formally appointing the UWG, initial versions of some of the above documents were reviewed by the UWG co-chair. The UWG first met on 24-25 January 1995 at CIESIN's headquarters in Michigan and subsequently met on 4-5 May 1995 at CIESIN's Washington DC office. The UWG has strongly endorsed the two initial applications development areas and has reemphasized the importance of SEDAC's Information Gateway mission. The first UWG report was delivered to SEDAC and NASA in February 1995 and the second is still in preparation.

Planning and documentation activities continued intensively through March 1995. These included preparation of the Existing System Inventory (CDRL-3), the Facility Plan (CDRL-18), the Prototyping Plan (CDRL-9), the Operations and Maintenance Plan (CDRL-17), the System Design Document (CDRL-10), and multiple drafts of the Implementation Plan (CDRL-11). The COTR, in May 1995, accepted the Facility Plan, Prototyping Plan, and draft Implementation Plan with suggested modifications. Reviews of other key deliverables such as the System Design Document have not yet been received. In part because of this delay, the Critical Design Review and the Annual On-Site Review have been postponed at the COTR's request.

In parallel with planning and documentation efforts, it has been important for SEDAC to begin providing relevant products and services as quickly as possible, in part to start building a user base and to help elucidate user needs and capabilities. With this in mind, SEDAC has made available selected products and services, typically in "beta" form to encourage user feedback. Such products include the Archive of Census-Related Data, the Census Exploration Software (and more recently the Ulysses tabulation system), the Gateway software, and selected georeferenced population data products. These provisional services have also allowed SEDAC to develop and test various procedures that are required as part of the basic SSOC and subsequent SEDAC System Operational Services.

During the past year, SEDAC has also regularly provided a Monthly Status Report (CDRL-1) and monthly Financial Reports (CDRL-8) to Goddard Space Flight Center (GSFC). No formal Quarterly Reports (CDRL-2) have been requested by the COTR. However, the SEDAC Manager or a designated alternate has attended the quarterly meetings of the Distributed Active Archive Center (DAAC) managers. SEDAC personnel have also participated in regular telecons (e.g., the weekly DAAC Managers telecon, the monthly Project Scientist telecon held in conjunction with one of the DAAC Managers telecon, and the System Engineers telecons) and in other relevant activities such as the User Services Working Group (USWG).

In preparation for the fall 1995 update to the Annual Work Plan (CDRL-16), SEDAC has, at the request of the COTR (letter dated 2 May 1995), prepared a draft of the Plan that is currently under review by the SEDAC UWG. The reviewed draft will be submitted to GSFC by 5 July 1995 so that it can be reviewed in conjunction with other DAAC work plans by the EOSDIS Data Panel and others.

As part of its technical proposal, CIESIN proposed a number of additional milestones to ensure appropriate SEDAC development and operation. These milestones included a number of the contract items described in this section as well as a number of additional reports and capabilities. These milestones are addressed on a task-by-task basis in Appendix A of this Annual Progress Report (CDRL-7).

During the course of the year, SEDAC has also provided presentations and documents and responded to questions from the NASA Inspectors General office and the General Accounting Office.

3.0 Basic SEDAC System Operating Capability

A key objective of SEDAC's first year of activity has been to develop the basic SEDAC System Operating Capability. Key elements of this capability, and a brief summary of their status as of the end of the first year, are:

1) *A Gateway system which provides distributed search-and-order capabilities across widely scattered directory and inventory servers using a common user interface.* Beta versions of the Gateway clients are now available via the Internet for UNIX X-Windows and Microsoft Windows-compatible personal computers. A character-based interface for directory-level searching is also available. Servers are functioning that provide access to a variety of directory- and inventory-level metadata including the Global Change Master Directory (GCMD). The Gateway system has recently won first prize in the Environment, Energy & Agriculture category of the prestigious 1995 Computerworld Smithsonian Awards Program and will be part of the Smithsonian's permanent research collection and a public exhibit at the National Museum of American History.

2) *A collection of human dimensions metadata.* SEDAC's metadata collection now contains more than 480 directory and 1,700 inventory entries plus guides for 32 datasets. A total of 43 directory entries have been submitted to the GCMD. Progress in metadata development is more fully documented in the *Metadata Development Report* (June 1995), a subtask 5.2 milestone.

3) *An active archive of human dimensions data.* SEDAC's archive now contains more than 60 datasets including several unique georeferenced population data sets and a file transfer protocol (ftp) archive of reprocessed U.S. Census data. During its first four months, the ftp archive served more than 200 unique hosts per month and delivered more than 20,000 files and 10 gb of data. Progress in archive development and management is more fully documented in the *Data and Information Management Plan* (June 1995), a subtask 5.4 milestone.

4) *Memoranda of Understanding (MoUs) or other agreements with more than a dozen different organizations (partners in CIESIN's Information Cooperative) to share metadata, provide access to data, and/or collaborate in other ways.* Key partners relevant to SEDAC applications development include the International Programs Center of the U.S. Bureau of the Census (formerly the Center for International Research), EROS Data Center (EDC), the International Union for the Conservation of Nature (IUCN), the National Institute on Public Health and Environmental Protection (RIVM) in the Netherlands, the United Nations Environment Programme/Global Resource Information Database (UNEP/GRID), the World Conservation Monitoring Centre (WCMC), the World Resources Institute, and key institutions in China.

5) *Online interactive access to an integrated population/land cover dataset for the coterminous U.S.* This dataset ties together 1-kilometer seasonal land cover data from EDC with gridded population and housing data. The data are initially being made available via ftp; a client designed to access these data using spatial references is under development.

6) *A set of query tools for tabular and text data accessible over the Internet.* These tools include the Ulysses tabulation system, which provides interactive access to the U.S. Census Public Use Microdata Samples (PUMS) for multiple decades, and the Policy Instruments Data Base (PIDB), which provides online query capabilities against a data base of international environmental treaties and associated status information. The Ulysses tabulation system is now undergoing a public beta test period. Data for the 1980 and 1990 1% PUMS are now available; data for 1970 and for selected years for China are expected to become available in the near future. Although the original plans included use of the Ulysses system with the integrated population/land cover dataset, the UWG has suggested continued development of Ulysses but recommended against the inclusion of the integrated data. A beta version of the PIDB is also expected to be released to the public in the next month.

7) *An integrated set of model visualization and analysis services.* The initial version of these services include online guides for the IMAGE 2.0 and MiniCAM integrated assessment models, an overall IAM thematic guide, and tools for displaying and re-aggregating model input and output data. The IAM guides include a rich set of online literature and documentation, including data dictionaries for the archived model scenarios.

It is of course expected that these capabilities will evolve and improve significantly during the coming year. A high priority is to improve integration of these elements into the overall SEDAC systems framework.

4.0 SEDAC Personnel and Contributors

CIESIN has been able to bring to bear highly qualified personnel and other individual and institutional contributors to carry out SEDAC's mission. The initial SEDAC team was led by Dr. L. G. "Sam" Thompson as SEDAC Manager with William Schanerberger as SEDAC Systems Engineer and Dr. Robert S. Chen as SEDAC Project Scientist. With Dr. Thompson's resignation in March 1995, Dr. Chen became SEDAC Manager and Thomas Parris of CIESIN's Government and International Programs Division became Acting Project Scientist (see Figure 1.3-1). The position of Project Scientist is currently open and is being advertised widely. Other members of the SEDAC Project Office include Rich Robinson, Manager of User Services; Dennis Schorn, Manager of Computer Services; and Cindy Plant, Administrative Analyst.

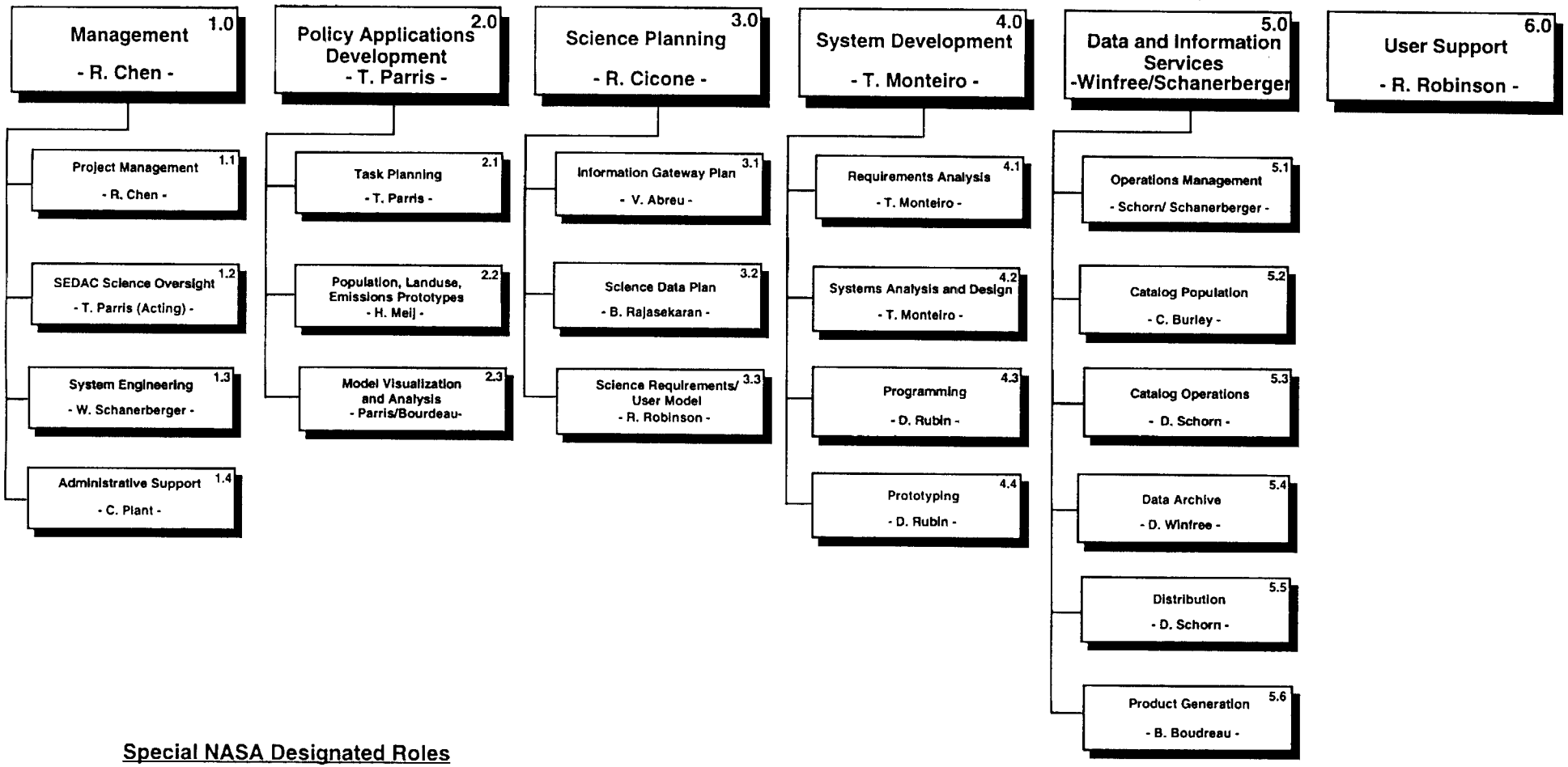
SEDAC task leadership is provided by an experienced set of individuals including Dr. Chen (Task 1), Thomas Parris (Task 2), Richard Cicone (Task 3), Anthony Monteiro (Task 4), David Winfree and William Schanerberger (Task 5), and Richard Robinson (Task 6). Subtask leaders include Cindy Plant (subtask 1.4), Dr. Hendrik Meij (subtask 2.2), Dr. Robert Bourdeau (subtasks 2.3 and 5.6), Dr. Vincent Abreu (subtask 3.1), Dr. B. Rajasekaran (subtask 3.2), David Rubin (subtasks 4.3 and 4.4), Dennis Schorn (subtasks 5.3 and 5.5), Cheryl Burley (subtask 5.2), and David Winfree (subtask 5.4). These individuals supervise staff and contractors assigned to SEDAC and ensure the effective and efficient completion of all project activities. The SEDAC core team consisting of all task and subtask leaders meets regularly and maintains close liaison with CIESIN line management and other CIESIN programs and projects.

Where appropriate, SEDAC draws on Consortium partner institutions and other contributors for specific capabilities, products, and services. Polytechnic University provides significant support for the System Development (Task 4) under subcontract to CIESIN. The SEDAC Systems Engineer is the technical contact for this subcontract. Development of the Ulysses tabulation system is led by researchers at the University of Michigan under the technical supervision of Dr. Robert Bourdeau. Development of specific system components such as a spatial client or selected IAM guides have been subcontracted to qualified individuals as needed. Such short-term subcontracts have been especially necessary given the compressed time schedule between the completion of key SEDAC design and implementation plans and the planned SSOC initiation.

SEDAC has also benefited greatly from the advice and guidance of a distinguished set of UWG members (see Table 1.3-1). The voluntary contributions of these individuals are critical to SEDAC's efforts to develop strong ties with the user and research communities and to provide well integrated products and services. UWG members have been active in providing not only overall recommendations and strategic guidance, but also detailed advice and assistance on specific SEDAC activities. A UWG Listserver established by SEDAC provides one useful mechanism for communication between UWG members, SEDAC staff, and NASA personnel.

Figure 4-1

SEDAC Project Structure and Task Management



Special NASA Designated Roles

R. Chen - SEDAC Manager
W. Schanerberger - SEDAC Systems Engineer
T. Parris - SEDAC Project Scientist (Acting)

12 May 95

Table 4-1. SEDAC User Working Group Membership.

John E. Estes	University California, Santa Barbara (co-chair)
Thomas M. Parris	CIESIN (acting co-chair)
Hal N. Anderson	Idaho Department of Water Resources
Eric Barron	Pennsylvania State Univ. Earth System Science Center
Martin David	University of Wisconsin, Department of Economics
Paul E. Davis	Mississippi Automated Resource Information System
Dennis Grossman	The Nature Conservancy
Harold K. Jacobson	University of Michigan, Institute of Social Research
Marc E. Levy	Princeton University, Woodrow Wilson School
Janice D. Longstreth	Virginia Tech, Waste Policy Institute
Donald Moore	EROS Data Center, International Programs Office
Edward Parson	Harvard University, Kennedy School of Government
Ronald Rindfuss	University of North Carolina, Carolina Population Center
Cynthia Rosenzweig	Goddard Institute for Space Studies
John Weyant	Stanford University, Energy Modeling Forum
Charles E. Wood	University of Texas-Austin, Department of Sociology
Gary Yohe	Wesleyan University, Department of Economics

An important area of progress during the past year has been the continued development of other institutional collaborations, including those with partners in CIESIN's Information Cooperative. For example, SEDAC has worked closely with RIVM in the Netherlands on making their IMAGE 2.0 IAM, model scenarios, and associated documentation available as part of SEDAC's Model Visualization and Analysis (MVA) services. Considerable progress has been made in developing collaboration with other individuals and groups involved in IAM development such as the Battelle Pacific Northwest Laboratory (developers of GCAM and MiniCAM), Carnegie-Mellon University (developers of ICAM), and Dr. T.M.L. Wigley (developer of MAGICC). SEDAC has agreed to work with the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria to utilize the MVA services in support of policy simulation exercises conducted under the auspices of the International Environment Commitments (IEC) Project. Discussions are also under way with the Stanford University Energy Modeling Forum, Oak Ridge National Laboratory, the Goddard Institute for Space Studies, and others about potential collaboration IAM activities. In addition, Dr. Chen has been awarded a NATO grant to hold an Advanced Research Workshop on Integrated Assessment of Global Environmental Change: Science and Policy, now scheduled for the fall of 1995.

Collaborative arrangements are now in place or under development in support of other SEDAC activities. For example, unique georeferenced population products are now being made available through agreements with the Census Bureau's International Programs Center, the National Center for Geographic Information and Analysis, and the Mexican statistical agency INEGI in Mexico. Cooperation with the World Conservation Union (IUCN), the United Nations Environment Programme (UNEP), the Tufts University Fletcher School of Law and Diplomacy, and Freedom House has been essential to the development of the PIDB prototype.

Discussions are currently under way with the European Council of Social Science Data Archives, which represents key European data archives, about making their extensive social science metadata resources available through the Information Gateway. Efforts to access metadata resources in China and Eastern Europe also have continued, including the training of individuals from those countries in the preparation and management of directory-level metadata in ways compatible with the Gateway software. The metadata efforts in China continue to tie in with the activities of the China in Time and Space (CITAS) project, which are supported in part by NASA grant funds, the Ford Foundation, and the voluntary contributions of a team of leading China scholars.

5.0 Outreach and User Support

As more products and services have become available, SEDAC has increased its outreach and user support activities significantly in a number of arenas. These include:

- participation in scientific, technical, and user-oriented meetings;
- establishment of a SEDAC home page on the World Wide Web (WWW);
- support for the AGIS-L discussion list and the U.S. government's National Electronic Open Meeting and increased visibility in other Internet fora;
- involvement in key interdisciplinary research activities and programs;
- demonstration of SEDAC capabilities to key audiences and review bodies;
- development of linkages with other DAACs and NASA research centers;
- preparation of brochures and handouts, articles in technical and user-oriented publications, display items, and other outreach materials;
- collection of user statistics and profile information and provision of these to NASA; and
- direct user support via telephone, electronic mail, and other access channels.

During the past year, SEDAC staff have conducted workshops and demonstrations in a wide range of venues including the 1995 Conference on Computing for the Social Sciences, the Advanced Digital Libraries '95 conference, the GIS/LIS conference, the First Open Meeting of the Human Dimensions of Global Environmental Change Community, the Conference of Parties of the Framework Convention on Climate Change, and annual meetings of the Association of Public Data Users, the State Data Centers, the Association of American Geographers, the Pacific Science Congress, and the International Association for Social Science Information Service and Technology. These activities serve to increase user awareness of SEDAC products and services and also provide important avenues for user feedback and interaction and the development of collaborative activities.

SEDAC scientific and technical staff also work directly with key research and user communities. For example, Dr. Chen is a member of the science committee for the Global Changes in Local Places project of the Association of American Geographers and the National Technical Advisory Committee for the National Institute for Global Environmental Change (NIGEC). He also participated actively in the 1994 Global Change Institute on Integrated Assessment of Climate Change. Dr. Meij works closely with the state data centers and manages the AGIS-L listserver. Dr. Darryl Charache

participated in the "International Workshop on Global Databases and GLOBE Meeting" organized by the International Society for Photogrammetry and Remote Sensing. Dr. B. Rajasekaran has close ties with the network of indigenous knowledge organizations around the world and has participated in a number of international meetings on desertification sponsored by the United Nations. Mr. Parris supported the Commission on Global Environmental Change Information Policy under the NASA Grant and maintains contact with key individuals and groups in the policy community. SEDAC User Support staff have given tours and presentations for local schools, colleges, business groups, and other interested organizations. SEDAC staff also participated in a site visit by the National Academy of Sciences subcommittee charged with assessing CIESIN as a possible World Data Center.

SEDAC staff have visited other NASA DAACs and centers such as Oak Ridge National Laboratory, EDC, and the Goddard Institute for Space Studies (GISS) and are discussing potential areas of collaboration, e.g., related to population, land use, and emissions and integrated assessment modeling. For example, Dr. Chen recently participated in a GISS workshop supported by the MTPE office on Assessing the Vulnerability of Agriculture to Changes in Climate and Air Quality in which the proposed GISS integrated assessment effort was presented and discussed. Potential collaboration with staff at GSFC is under discussion, e.g., related to the integration of Operational Line Scan data with Census boundaries and data.

Development of a new SEDAC brochure that better reflects SEDAC's missions and major activities is nearing completion. SEDAC has also developed an attractive and flexible booth display that takes good advantage of graphics generated by ongoing projects. Other outreach materials include SEDAC-relevant announcements and other material in the monthly magazine *Environment* and an article in the newsletter *Space Times*. SEDAC has also begun to take advantage of the diverse fora on the Internet for announcing products, services, and other activities.

Finally, SEDAC has engaged in extensive efforts to document present and potential users. SEDAC currently provides NASA with user logs and statistics for 4 of 5 possible access channels on a monthly basis per NASA requirements. On average, SEDAC services each month about 100 direct requests for data and information which arrive via electronic mail, telephone, fax, or other means. During the Census Exploration Software beta test period, SEDAC supported some 300 beta test accounts that averaged about 430 accesses per month producing 1,500 tables. At present, about 64 Gateway beta test accounts have been established. User statistics for the initial Ulysses tabulation system beta test are not yet available. The SEDAC/CIESIN WWW server averaged 1,300 users and 11,000 transactions per week in May 1995, a 300% increase in transactions over January 1995.

In part because user statistics indicate relatively little about the nature and purpose of actual data use, SEDAC has supported continued efforts to develop user profiles and a user model. In general, this requires efforts to follow up with data users, since users often cannot give an assessment of the utility or ease of use of products and services

until they have had a reasonable opportunity to work with them. A number of users have indicated their satisfaction with data or services received to date, are interested in additional types of services, and can point to specific instances where SEDAC assistance has been of considerable value to them. Further information about these user results is documented in the *User Model Report* (June 1995). Due to schedule changes agreed upon between the SEDAC and its COTR/CO, preparation of the *Functional Requirements Report* milestone under subtask 3.3 has been postponed until Option Year 1.

6.0 Infrastructure and Capabilities

Underlying the basic SSOC and related activities described in the previous sections are some basic improvements in SEDAC's infrastructure and technical capabilities. These include improvements in system configuration and management; implementation of standard operational procedures for systems operation, metadata management, and data archiving; and development of new tools and capabilities.

With regard to basic systems operations, significant progress has been made during the past year in:

- Improvement of SEDAC's operational computing environment including migration of the UNIX file system from AFS (Andrew File System) to NFS (Network File System) and installation of RAID storage systems for the main archive;
- Separation of development and production environments and implementation of procedures to control transfers between these environments;
- Establishment of a secure data ingest and processing area at CIESIN's headquarters facility;
- Implementation of a network/communication monitoring system and improvements in system security and backup procedures;
- Implementation of procedures to allow alternative-server access for better system response time and reconfiguration of application software to optimize use of available computing resources (e.g., through reducing the number of compute nodes required by the Census Exploration Software);
- Tracking of hardware and software configuration and utilization and user logs and statistics;
- Review of ECS development activities in relationship to SEDAC system planning; and
- Improvement in data distribution methods, including installation of CD-ROM production hardware, reconfiguration of ftp sites, and development of user registration screens and other online access tools.

In the area of metadata development and data archiving, SEDAC has continued to make progress in:

- Documenting of metadata development procedures for both internal and external use (see *CIESIN Metadata Guidelines*, May 1995);

- Documenting of appropriate index terms and rules for their use (see *CIESIN Indexing Vocabulary*, May 1995);
- Development of needed software tools to facilitate metadata management;
- Development and maintenance of standards for metadata, including directory- and inventory-level metadata and guide products;
- Development of training materials to aid external organizations and personnel in consistent metadata management;
- Coordination of metadata identification efforts by SEDAC scientific and technical staff, including special attention to Information Cooperative partners and online data available over the Internet;
- Implementation of data storage, backup, and quality assurance procedures consistent with applicable federal regulations and guidelines;
- Streamlining processes for acquiring, ingesting, and obtaining permissions for online guide materials; and
- Development, documentation, and implementation of data policies consistent with NASA and US Global Change Program policies and guidelines.

Finally, in the area of the development of new tools and capabilities, SEDAC has pursued a number of activities that should enhance and make more efficient future development and operational activities. These include:

- Development of an abstract data model for managing data associated with IAMs which should be applicable to other data types;
- Acquisition of selected data visualization and analysis tools and development of supplementary software when necessary to meet both short- and long-term SEDAC needs;
- Preliminary utilization of a set of models and data developed under NASA grant funds for the estimation of ground-level exposure to ultraviolet radiation (drawing in part on the work of Dr. Charache, who developed these tools as part of his dissertation from the University of Michigan);
- Development of a range of data and tools concerned with China and associated relationships with data and research organizations in China, including datasets and connections that emerged from the China and Time and Space (CITAS) project under NASA grant funds;
- Development of systems for monitoring labor usage, travel costs, and other expenditures and for managing office files.

References

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1994 - June 1995. *SEDAC Monthly Status Reports CDRL-1.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). **DATE.** *SEDAC Quarterly Report CDRL-2.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). July 1994. *SEDAC Existing System Inventory CDRL-3.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). October 1994. *SEDAC Requirements Analysis Report CDRL-4.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). November 1994. *SEDAC Architecture and Operations Concept Document CDRL-5.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). October 1994. *SEDAC Functional and Performance Requirements Specification CDRL-6.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1995. *SEDAC Annual Progress Report CDRL-7.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1994 - June 1995. *SEDAC Financial Reports CDRL-8* . University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). January 1995. *SEDAC Prototyping Plan CDRL-9.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). March 1995. *SEDAC System Design Document CDRL-10.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). March 1995. *SEDAC Implementation Plan CDRL-11.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). September 1994. *SEDAC Policy Applications Development Plan CDRL 12.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). September 1994. *SEDAC Information Gateway Plan CDRL 13.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). November 1994. *SEDAC Science Data Plan CDRL 14.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). *SEDAC Management Plan Revised CDRL 15.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). July 1995. *SEDAC Annual Work Plan CDRL 16.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). January 1995. *SEDAC Operations and Maintenance Plan CDRL 17.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). *SEDAC Facility Plan CDRL 18.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1995. *SEDAC User Model Report.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1995. *Metadata Development Report.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). May 1995. *CIESIN Metadata Guidelines.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). May 1995. *CIESIN Indexing Vocabulary.* University Center, MI: CIESIN.

Consortium for International Earth Science Information Network (CIESIN). Socioeconomic Data and Applications Center (SEDAC). June 1995. *Data and Information Management Plan .* University Center, MI: CIESIN.

Acronyms and Abbreviations

AFS	Andrew File System
AGIS-L	Atlas GIS Listserver
CD-ROM	Compact Disk Read-Only Memory
CDRL	Contract Data Requirement List
CEOS	Committee on Earth Observation Satellites
CIESIN	Consortium for International Earth Science Information Network
CITAS	China in Time and Space
COTR	Contracting Officer's Technical Representative
CS	Catalog Subgroup (CEOS)
DAAC	Distributed Active Archive Center
ECS	EOSDIS Core System
EDC	EROS Data Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
FTP	File Transfer Protocol
GB	Gigabytes
GCAM	Global Change Assessment Model (Batelle)
GCMD	Global Change Master Directory
GIS	Geographic Information System
GISS	Goddard Institute for Space Studies
GLOBE	Global Land One-kilometer Base Elevation
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HQ	Headquarters
HTML	HyperText Markup Language
IAM	Integrated Assessment Model
ICAM	Integrated Climate Assessment Model (Carnegie-Mellon Univ.)
ICPSR	Inter-university Consortium for Political and Social Research
IEC	International Environment Commitments
IGP	Information Gateway Plan
IIASA	International Institute for Applied Systems Analysis
IMAGE	Integrated Model to Assess the Greenhouse Effect
IMS	Information Management System
INEGI	International Program Center fo the U.S. Bureau of the Census
IUCN	International Union for the Conservation of Nature
LIS	Library Information Subgroup

MAGICC	Model for the Assessment of Greenhouse gas Induced Climate Change
MoU	Memoranda of Understanding
MTPE	Mission to Planet Earth
MVA	Model Visualization Analysis
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NIGEC	National Technical Advisory Committee for the National Institute for Global Environmental Change
NFS	Network File System
PIDB	Policy Instrument Database
PUMS	Public Use Microdata Samples (U.S. Census)
RAID	Redundant Array of Inexpensive Disks
RIVM	National Institute on Public Health and Environmental Protection
SEDAC	Socioeconomic Data and Applications Center
SOW	Statement of Work
SSOC	System Operating Capability
UNEP/GRID	United Nations Environment Programme/Global Resource Information Database
UWG	User Working Group
WBS	Work Breakdown Structure
WCMC	World Conservation Monitoring Centre
WGD	Working Group on Data (CEOS)
USWG	User Services Working Group
WWW	World Wide Web

Appendix A
Summary of Accomplishments by SEDAC Task/Subtask

Task 1.0 Management

Task 1.1 Project Management

- Established the SEDAC Project Office within CIESIN
- Provided program management including supervision and review of all deliverables
- Completed Annual Work Plan for 1994-95, CDRL-16, and draft of Annual Work Plan for FY96
- Completed Annual Progress Report, CDRL-7
- Completed SEDAC Proposal resulting in letter contract
- Completed Management Plan, CDRL-15
- Conducted successful Program Management Review
- Completed negotiation of first-year contract
- Supervised staff assignments and implementation of subcontracts
- Represented SEDAC in key outreach activities and in NASA-mandated meetings
- Provided liaison to the ESDIS Project, NASA headquarters, NASA subcontractors, etc.

Task 1.2 SEDAC Science Oversight

- Provided science guidance and quality assurance for all Tasks, especially the development of policy applications and the Information Gateway
- Organized the SEDAC Users Working Group (UWG) in coordination with NASA
- Organized and co-chaired the first two SEDAC UWG meetings
  CIESIN - Saginaw, MI - January 23-24, 1995
  CIESIN - Washington, DC - May 4-5, 1995
- Developed links with scientific staff at other DAACs and NASA data centers
- Represented SEDAC in key scientific meetings and publications

Task 1.3 Systems Engineering

- Supervised overall system planning and development
- Conducted successful Preliminary Design Review at NASA HQ
- Provided technical supervision to SEDAC information technology subcontracts
- Developed new Statement of Work and Subcontract Agreement for subcontracted system development
- Coordinated computer hardware needs analysis, configuration planning, and acquisition
- Conducted two technical program reviews for subcontracted system development
- Ensured system compatibility within SEDAC and between SEDAC and EOSDIS
- Completed the Architecture and Operations Concept Document, CDRL-5
- Developed links with engineering staff at other DAACs, NASA, and NASA subcontractors (e.g., EOSDIS System Engineer teleconferences, ECS system/ subsystem reviews, etc.)
- Ensured traceability of system functionality to user requirements

Task 1.4 Administrative Support

- Completed the Facility Plan, CDRL-18
- Analyzed, monitored, and supervised the budget including conduct of a cost-to-complete analysis
- Developed a Labor Monitoring System
- Developed a Travel Monitoring System
- Developed an electronic database filing system
- Supervised administrative and support activities and staff
- Ensured timely production and transmission of deliverables
- Provided logistical support for meetings of the UWG, onsite and offsite reviews, and various technical and outreach activities as required
- Coordinated the production of graphics to illustrate SEDAC products for the SEDAC booth
- Assisted in the production of the SEDAC brochure

Task 2.0 Policy Applications Development

Task 2.1 Task Planning

- Formed Policy Applications Development Team
- Developed plans for subtasks 2.2 and 2.3 and secured UWG endorsement
- Completed the Policy Applications Development Plan, CDRL-12
- Developed the Policy Instruments Data Base prototype and a proposal for its further development; secured preliminary UWG endorsement
- Developed proposal for stratospheric ozone/health policy application and secured provisional NASA and UWG approval for continued exploration
- Developed proposal for China land use change policy application and secured UWG approval for continued exploration*
- Investigated other possible policy applications that involve integration of socioeconomic data with earth science data, especially remote sensing data.

Task 2.2 Population, Land Use, and Emissions

- Developed subtask objectives and goals
- Developed ftp archive of Census-related data for widespread dissemination of U.S. population data in easy-to-use form
- Acquired, reprocessed, and made available Center for International Research georeferenced population data for more than 100 countries (released under NASA Grant)
- Acquired and reprocessed National Center for Geographic Information and Analysis Gridded Population of the World dataset (developed under NASA Grant)
- Supported beta test of Census Exploration Software (developed under NASA Grant) and development of next generation Ulysses software for interactive access to population data
- Acquired and integrated EROS Data Center Seasonal Land Cover dataset (1-kilometer resolution based on AVHRR data)
- Developed integrated population/land cover dataset for Michigan and the remainder of the coterminous United States
- Developed interactive mapping software to permit access to and analysis of integrated dataset

* Note: Together, these three proposals constitute the "summary of policy applications development opportunities" milestone in the SEDAC proposal.

- Established AGIS-L listserver with UWG approval and Strategic Mapping, Inc. cooperation to enhance interactions with users of desktop mapping. List subscription has grown to 325 in less than 2 months.
- Identified and developed working relationships with a diversity of policy and decision makers and other users

Task 2.3 Model Visualization and Analysis

- Developed subtask objectives and goals
- Acquired IMAGE 2.0, MiniCAM, and MAGICC Integrated Assessment Models (IAMs) and associated input and output datasets
- Developed working relationships with key modeling groups at Battelle Pacific Northwest Laboratory, RIVM, the National Center for Atmospheric Research, Carnegie-Mellon University, the Massachusetts Institute of Technology, Stanford University, and elsewhere
- Designed, prototyped, and began population of thematic and model guides for IAMs and obtained permissions to place selected guide materials online
- Designed and initiated development of model visualization and analysis tools
- Submitted successful proposal to the North Atlantic Treaty Organization for travel and logistical funds to hold an Advanced Research Workshop on Integrated Assessment of Global Environmental Change: Science and Policy (presently scheduled for fall 1995)
- Developed contacts with relevant policy analysts and users and coordinated activities with policy exercises planned by the International Institute for Applied Systems Analysis
- Participated in key meetings relevant to integrated assessment including the 1994 Global Change Institute and the 1995 Conference of Parties of the Framework Convention on Climate Change.

Task 3.0 Science Planning

Task 3.1 Information Gateway Plan

- Completed the Information Gateway Plan, CDRL-13
- Identified Information Cooperative partner organizations important to policy applications development
- Identified key interdisciplinary domains of importance to U.S. and international global change research

- Provided overall planning and coordination of SEDAC Information Gateway linkages, including development and implementation of Memoranda of Understanding or other formal agreements to share data and/or support development of policy applications
- Identified and documented Internet-accessible servers developed by Information Cooperative partner organizations
- Developed relationships with key organizations in China needed to support access to human dimensions data

Task 3.2 Science Data Plan

- Completed the Science Data Plan, CDRL-14
- Identified and acquired datasets that are needed to support applications development and secured preliminary UWG approval
- Identified high priority Information Gateway partners and secured preliminary UWG approval
- Identified and reviewed Information Gateway partners' datasets that could be disseminated through the Gateway
- Provided science guidance on high priority areas for development of directory, inventory, and guide metadata
- Conducted an assessment of the status of SEDAC datasets and provided science priorities for archiving.
- Completed current and projected SEDAC science data holdings for EOSDIS Science Data Plan

Task 3.3 User Model and Requirements

- Worked closely with the Policy Applications Development Team and with SEDAC User Services to identify and characterize users
- Conducted an assessment of users' needs for socioeconomic data
- Completed user model report
- Contacted a range of actual users to develop user scenarios and profiles and ascertain utility and value of services

Task 4.0 System Development

Task 4.1 Requirements Analysis

- Completed the Requirements Analysis Report, CDRL-4
- Completed the Functional and Performance Requirements Specification, CDRL-6

Task 4.2 Systems Analysis and Design

- Completed the Existing Systems Inventory, CDRL-3
- Completed the Preliminary and Final System Design Documents, CDRL-10
- Collaborated with NASA and NASA subcontractors on development of SEDAC-EOSDIS IMS interoperability

Task 4.3 Programming

- Developed client interface for Information Gateway services
- Developed Data Management Subsystem components for distributed data search and order
- Developed data server interfaces for use of commercial DBMS and structured WAIS
- Developed data order capability for Data Server Subsystem
- Completed first and second draft Implementation Plans (partial fulfillment of CDRL-11)
- Integrated the use of WWW services into client and metadata functions

Task 4.4 Prototyping

- Completed the Prototyping Plan, CDRL-9
- Developed prototype for browsing and visualization of time-series tabular data
- Developed prototype service for interactive access to census data
- Deveoped prototype client interface for directory metadata management
- Developed alternative design for Client Subsystem

Task 5.0 Data and Information Services

Task 5.1 Operations Management

- Completed the Operations and Maintenance Plan, CDRL-17
- Developed documentation for hardware configuration and utilization
- Developed an equipment inventory, initiated purchasing, and planned installation process
- Put in place security and backup procedures for Computer facility
- Coordinated introduction of new hardware, software, and services into CIESIN's computing environment, taking into account SEDAC's requirements

Task 5.2 Catalog Population

- Populated the Catalog with directory, inventory, and guide metadata:
  - Directory metadata for 486 data sets
  - Inventory metadata for 54 data sets (more than 1,700 items)
  - Guide metadata for 32 data sets
- Submitted 43 directory entries to the Global Change Master Directory (GCMD)
- Completed *CIESIN Metadata Guidelines* which documents metadata development procedures for SEDAC use internally and at distributed Information Cooperative sites
- Completed *CIESIN Indexing Vocabulary* which specifies appropriate index terms and rules for their use
- Identified requirements for software tools to facilitate metadata entry
- Worked with Information Cooperative partners to develop and quality check metadata at distributed sites
- Represented SEDAC in EOSDIS working groups addressing vocabulary issues, descriptive format standards, and data set guide development
- Prepared end-of-year *Metadata Development Report* milestone

Task 5.3 Catalog Operations

- Supported Gateway Beta Test activities
- Supported operations for internal development and external users
- Implemented mechanisms for automated collection of usage statistics
- Implemented RAID storage systems for main archive
- Implemented network/communication monitoring system
- Implemented new network file system to replace heritage Andrew File System for basic file access
- Investigated methods for providing secure access to Internet users
- Implemented scheme to allow alternative-server access for better system response time

Task 5.4 Data Archive

- Identified, acquired, and archived datasets according to priorities given in the Science Data Plan
- Supported development of the IAM guides
- Instituted data storage, backup, and quality assurance procedures consistent with applicable federal regulations and guidelines

- Developed and implemented data policies consistent with NASA and US Global Change Program policies and guidelines
- Developed access to selected data and/or metadata resources of numerous organizations including the Inter-university Consortium for Political and Social Research (ICPSR), the International Program Center of the U.S. Bureau of the Census, the Mexican statistical organization (INEGI), the World Conservation Union(IUCN), the World Resources Institute, Statistics Canada, and the World Bank
- Archived a set of georeferenced population data products for Mexico
- Initiated collaboration with the European Council of Social Science Data Archives to establish a a European node for relevant human dimensions data in European archives

Task 5.5 Distribution

- Evaluated, acquired, installed, and tested devices to produce CD-ROMs
- Evaluated, acquired, installed, and tested User Services equipment for creating 9-track, 8mm, 4mm tapes and 3.5" diskettes
- Implemented FTP server access to data
- Supported distribution needs of application tasks (e.g. Census/Landuse integration)

Task 5.6 Product Generation

- Created and began implementation of major portions of the SEDAC System Design in support of the policy applications.
- Evaluated and selected data visualization and analysis tools, as well as data storage and retrieval software for use in required policy application services
- Developed algorithms to grid, display, and condition 1 km^2 population data
- Began development of a custom user interface to support spatial subsetting of Task 2.2 data sets
- Developed an abstract data model for managing data associated with integrated assessment models (IAMs), and implemented using two technologies: HDF format for gridded data and Oracle for metadata and all non-gridded data.
- Developed tools for mapping and plotting data associated with IAMs.
- Developing a WWW-based server application capable of guiding users through the process of browsing and visualizing precomputed scenarios from IAMs.

Task 6.0 User Support

- Established a User Support Team which meets EOSDIS requirements and efficiently handles all requests for data and information
- Represented SEDAC at EOSDIS User Services Working Group activities including meetings in Huntsville AL and Fairbanks AK
- Serviced each month an average of
  - 100 requests for data and information
  - 300 Census Exploration Software beta test accounts
  - 64 Gateway Beta Test Accounts
  - 5,500 WWW/Gopher/FTP accesses, 52,000 transactions
  - 430 Census Exploration Software accesses producing 1,500 tables
- Began providing monthly user logs and statistics for 4 of 5 possible access channels, per NASA requirements
- Coordinated beta test of census Data Exploration Software and initiated beta test of next generation Ulysses tabulation software
- Supported a number of outreach activities including selected user-oriented and technical conferences and the U.S. government National Electronic Open Meeting